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In the claims:

Please amend the claims as follows:

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1. (Original) A displacement transducer comprising:

first and second non-ferromagnetic coil forms with a common axis, each wound with at least one winding;

the outside diameter of the first form with its winding or windings being smaller than the inside diameter of the second form so that each may be displaced relative to the other with the first form inside the second form;

one of the coil forms being movable and the other coil form being stationary;

the winding or windings on the movable form magnetically coupled to the winding or windings on the stationary form in the absence of any ferromagnetic element inductively coupling the windings; and

electronic circuitry generating a signal responsive to relative displacements between the coil forms in the range of microns or less.

2. (Original) The transducer of claim 1, in which the sensor comprises;

the coil form with the smaller outside diameter wound with two or more windings and the other coil form wound with a single winding.

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3. (Original) The transducer of claim 1, in which the sensor comprises;

the coil form with the larger inside diameter wound with two or more windings and the other coil form wound with a single winding.

[Please add the following new claims:]

4. (New) A position sensor, comprising:

a moving coil part, having a first coil form that is constructed of a non ferromagnetic material, and a coil element having an electrical connection part, formed around said first coil form, said moving coil part constrained to move in a linear direction, and said moving coil part including a connection element adapted for connection to a moving object of interest;

a stationary coil part, having a second coil form also constructed of a non ferromagnetic material, and a second coil element wound on said second coil form, with said second coil element having at least first and second electrical connections

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which produce an output signal indicative of a relative moving relationship between said moving coil part and said stationary coil part, said stationary coil part sufficiently close to said moving coil part such that magnetic flux from said moving coil part is induced into said stationary coil part, wherein said first and second coil forms are formed of solid, non-ferromagnetic material.

5. (New) A position sensor as in claim 4, wherein said coil forms are formed of a material from the group consisting of plastics, ceramics, composite without ferromagnetic content, or paramagnetic material.

6. (New) A position sensor as in claim 4, wherein said coil form is formed of non ferromagnetic adhesive.

7. (New) A position sensor as in claim 4, further comprising excitation electronics, producing a first waveform of a specified type, connected to said electrical connection part of said moving coil part to excite said moving coil part with said first waveform.

8. (New) A position sensor as in claim 7, further

comprising signal processing electronics, connected to said first and second electrical connections of said stationary coil part, and receiving voltages from said first and second stationary coil part induced by movement of said moving coil part.

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9. (New) A position sensor as in claim 8, wherein said signal processing electronics includes a differential amplifier which differentially amplifies signals from said first and second electrical connections of said stationary coil parts, respectively.

10. (New) A position sensor as in claim 4, further comprising a shell, surrounding said position sensor, said shell formed of a material which does not shield against magnetic fields.

11. (New) A position sensor as in claim 10, wherein said shell is formed of a material which produces a magnetic field.

12. (New) A position sensor as in claim 9, wherein said first waveform is a pure sine wave.

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13. (New) A position sensor as in claim 7, wherein said excitation electronics includes a square wave generator, and a low pass filter, filtering an output of said square wave generator to remove substantially all harmonics of the square wave above a desired fundamental frequency.

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14. (New) A position sensor as in claim 9, further comprising a multiplier circuit, connected to an output of said differential amplifier, and a phase shift circuit, receiving said first waveform, and producing a phase shifted version of said first waveform coupled to another input of said multiplier circuit, said multiplier multiplying said signals to provide a synchronous signal proportional to a position of the moving primary coil.

15. (New) A position sensor as in claim 14, wherein said phase shift circuit is coupled directly between said excitation electronics and said multiplier circuit.

16. (New) A position sensor as in claim 14, wherein said phase shift circuit is provided between said excitation electronics and said moving coil part.

17. (New) A position sensor as in claim 9, wherein said signal processing electronics includes a first amplifier which produces an first output indicative of an input, and a second amplifier which produces second output indicative of an inverted version of said input, and an analog switch, operable to switch between said first and second outputs of said first and second amplifiers.

18. (New) A position sensor as in claim 17, further comprising a phase shifting element, phase shifting said first waveform to produce a control signal for said analog switch.

19. (New) A position sensor as in claim 4, further comprising said object of interest.

20. (New) A position sensor as in claim 19, wherein said object of interest includes a connection to a molecular force probe.

21. (New) A position sensor as in claim 19, wherein said object of interest includes a connection to a surface profiling instrument.

22. (New) A position sensor as in claim 19, wherein said object of interest includes a connection to an atomic force microscope.

23. (New) A method, comprising:

configuring a first coil and a second coil to minimize Barkhausen noise within the first and second coils; and

moving the first coil relative to the second coil to obtain a signal indicative of the moving which is substantially independent of said Barkhausen noise.

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24. (New) A method as in claim 23, wherein said configuring comprises forming said coils without ferromagnetic materials in the core.

25. (New) A method as in claim 23, wherein said configuring comprises using a material as the core which does not include grain boundaries that are capable of pinning domain walls.

26. (New) A method as in claim 23, wherein said configuring comprises using a material which does not include metastable magnetic states.

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27. (New) A position sensor assembly, comprising:

a primary non ferromagnetic coil assembly including a coil form formed of a non ferromagnetic material, having an outer surface against which at least a portion of a coil is adapted to be wound, and having a primary coil wound around said outer surface, said primary non ferromagnetic coil assembly being coupled to a movable object of interest, and being movable according to movement of the movable object of interest;

at least first and second stationary coil assemblies, each including a non ferromagnetic coil form, having an outer surface against which the coil is adapted to be wound, and each having a coil wound against said outer surface, said first and second stationary coil assemblies being located adjacent to said primary non ferromagnetic coil assembly; and

an electronics portion, producing electrical current to one of said coil assemblies, and receiving an induced signal from the other of said coil assemblies, and determining a position of said primary non ferromagnetic coil assembly relative to said first and second stationary coil assemblies from said induced signal, said determining being capable of a determination on the order of a micron resolution or better.

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28. (New) An assembly as in claim 27, wherein said coil forms of said coil assemblies are made from a material from the group consisting of plastics, ceramics, composites without ferromagnetic content, or paramagnetic material, and said material forms an outer surface against which said coil is wound.

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29. (New) An assembly as in claim 27, wherein said coil forms of said coil assemblies are made from a non ferromagnetic adhesive, which forms the surface against which said coils are wound.

30. (New) An assembly as in claim 27, wherein said electronics portion includes a differential amplifier which receives the induced signal, which produces a voltage proportional to displacement amount of said primary coil assembly.

31. (New) An assembly as in claim 27, wherein said electronics portion includes a driving circuit that produces a substantially pure sine wave, coupled to said primary non ferromagnetic coil assembly.

32. (New) An assembly as in claim 31, wherein said driving circuit includes a square wave oscillator and a low pass filter, removing harmonics of an output of the square wave oscillator that are above a fundamental of the low pass filter.

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33. (New) An assembly as in claim 27, wherein said electronics portion includes a driving circuit that produces a drive signal to said primary non ferromagnetic coil assembly.

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34. (New) An assembly as in claim 33, wherein said electronics portion also includes a receiver circuit including a differential amplifier, that receives an induced output from said first and second stationary coil assemblies.

35. (New) An assembly as in claim 33, further comprising said low pass filter at one input, and receiving an output of said differential amplifier at another input, and multiplying said one input and said another input to produce a synchronous output.

36. (New) An assembly as in claim 35 further comprising a phase shifting element, which phase shifts one of said signals relative to the other of said signals.

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37. (New) An assembly as in claim 33, further comprising a synchronizing element which synchronizes a detection of a signal from said receiver circuit with a desired time of detection based on said drive signal.

38. (New) An assembly as in claim 37, wherein said synchronizing element includes a phase shifting circuit which phase shifts one signal relative to another.

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39. (New) An assembly as in claim 37, wherein said synchronizing element includes a switching circuit which closes switch parts at desired times to synchronize detection with closing of the switch element.

40. (New) A method comprising:

using a force detecting element to move a moving coil part linearly, which moving coil part is formed without ferromagnetic materials;

driving said moving coil part with a driving signal, and detecting an induced signal on a stationary coil part which is formed without ferromagnetic materials, to produce an output signal indicative of a moving relationship between said moving

coil part and said stationary coil part, said stationary coil part sufficiently close to said moving coil part such that magnetic flux from said moving coil part induces a current in said other coil part; and

using said output signal to detect information from said force detecting element indicative of a resolution in range of microns or less.

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41. (New) A method as in claim 40, wherein said force detecting element is an atomic force detecting cantilever that detects a surface profile.

42. (New) A method as in claim 40, wherein said atomic force detecting element produces images of surface topography.

43. (New) A method as in claim 40, further comprising forming said moving coil parts and said stationary coil parts by winding coils around materials without ferromagnetic content, said winding comprising pressing at least a part of a wire forming a coil against a surface of said materials.

44. (New) A method as in claim 43, wherein said coil form is formed of a material from the group consisting of plastics,

ceramics, a paramagnetic material, or a composite material without ferromagnetic content.

45. (New) A method as in claim 43, wherein said coil form is formed of non ferromagnetic adhesive.

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46. (New) A method as in claim 40, wherein said using comprises synchronously detecting the output signal relative to a drive signal.

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47. (New) A method as in claim 46, wherein said synchronously detecting comprises synchronizing detection of a characteristic of the output signal relative to a characteristic of said driving signal.

48. (New) A method as in claim 47, wherein said synchronizing detection comprises phase shifting said output signal relative to said driving signal.

49. (New) A method as in claim 46, wherein said synchronous detector comprises using a signal indicative of the driving signal to drive a switch.

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50. (New) A position sensor, comprising:

a moving coil part, having a first coil form formed of a non ferromagnetic solid material, and a coil element having an electrical connection part, formed around said first coil form, said moving coil part constrained to move in a linear direction, and said moving coil part including a connection element adapted for connection to a moving object of interest; and

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a stationary coil part, having a second coil form, also formed of a non ferromagnetic solid material, and a second coil element wound on said second coil form, with said second coil element having at least first and second electrical connections which produce an output signal indicative of a moving relationship between said moving coil part and said stationary coil part, said stationary coil part sufficiently close to said moving coil part such that magnetic flux from said moving coil part induces a current in said stationary coil part.

51. (New) A position sensor, comprising:

a moving coil part, having a first coil form formed of a non ferromagnetic material, and a coil element having an electrical connection part, formed around said first coil form, said moving coil part constrained to move in a linear direction, and said moving coil part including a connection element adapted

for connection to a moving object of interest;

a stationary coil part, having a second coil form also formed of a non ferromagnetic material, and a second coil element wound on said second coil form, with said second coil element having at least first and second electrical connections which produce an output signal indicative of a moving relationship between said moving coil part and said stationary coil part, said stationary coil part sufficiently close to said moving coil part such that magnetic flux from said moving coil part is induced into said stationary coil part; and

a shell material, surrounding at least a part of said moving coil part and stationary coil part, said shell material supporting an external magnetic field therein.

52. (New) A position sensor assembly, comprising:

a primary non ferromagnetic coil assembly including all non ferromagnetic material, coupled to a movable object of interest, and being movable according to movement of the movable object of interest;

at least first and second stationary coil assemblies, each including all non ferromagnetic materials, said first and second stationary coil assemblies being located adjacent to said primary non ferromagnetic coil assembly; and

an electronics portion, producing electrical current to one of said coil assemblies, and receiving an induced signal from the other of said coil assemblies, and determining a position of said primary non ferromagnetic coil assembly relative to said first and second stationary coil assemblies from said induced signal, said electronics portion including a synchronizing element which synchronizes a detection of a signal from said receiver circuit with a desired time of detection based on said drive signal.

53. (New) A method, comprising:

driving a primary coil with a voltage;

sensing voltages induced into a plurality of secondary coils, from movement of the primary coil relative to the secondary coils, in a way that avoids parts ofthe signal being effected by Barkhausen noise.

54. (New) A method, comprising:

using a molecular force probe to cause deflection of a cantilever; and

using movements of said cantilever to drive a plurality of coils which detects said movements substantially without being effected by Barkhausen noise.

55. (New) A method, comprising:

using a surface profiling instrument to cause a deflection; and

moving using movements caused by the deflection to drive a plurality of coils to detect said movements substantially without being effected by Barkhausen noise.

56. (New) A method, comprising:

using an atomic force microscope to cause a deflection; and

moving using movements caused by the deflection to drive a plurality of coils to detect said movements substantially without being effected by Barkhausen noise.

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57. A system, comprising:

an atomic force microscope having an optical detection system, said atomic force microscope defining a frame of reference, said atomic force microscope having a cantilever, with a flexure that constrains the cantilever to move in a specified axis relative to said frame of reference, and with a moving coil part which detects movement of the cantilever in the direction of the specified axis, said moving coil being formed without ferromagnetic materials.

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58. A system as in claim 57, wherein said moving coil includes a coil mounted on a solid form.

59. A system as in claim 57, wherein the specified axis is a z axis relative to the frame of reference.

60. A system as in claim 57, wherein the specified axis is the x and/or y axis relative to the frame of reference.